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Pseudo-spontaneous Symmetry Breaking in Hydrodynamics and Holography

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We investigate the hydrodynamics of systems with pseudo-spontaneously broken $U(1)$ - symmetry and Goldstone phase relaxation. The proposed hydrodynamic framework capturing these, in principle independent, effects is tested within two concrete holographic models. We find agreement between the hydrodynamic dispersion relations and the quasi-normal modes of both holographic models. In case of an explicit $U(1)$ symmetry breaking we show the validity of a universal relation between the phase relaxation rate, the mass of the pseudo-Goldstone and the Goldstone diffusivity.

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